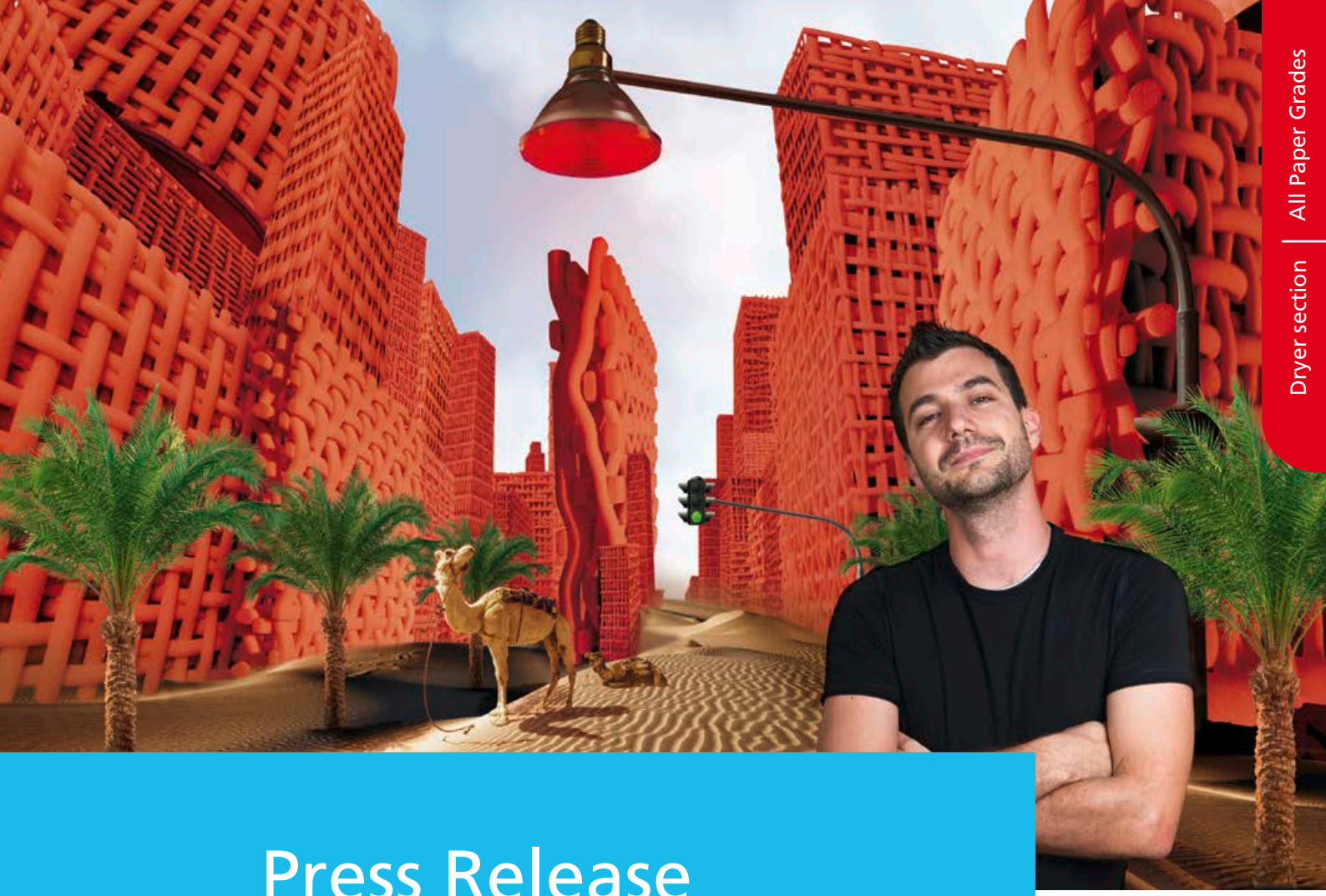

Press Release

How to Generate a Cleaner Dryer Section: More efficient cleaning with a new fabric design

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How to Generate a Cleaner Dryer Section: More efficient cleaning with a new fabric design

Paper machines and paper machine clothing suffering from contamination due to impurities in the furnish is an ever-increasing problem. The principal driver in this is the lower quality of waste paper that is available nowadays. In the dryer section, in particular, heavily contaminated fabrics have a detrimental effect on the production process. Heimbach, a leading manufacturer of paper machine clothing, has developed a dryer fabric that reduces susceptibility to contamination and makes high-pressure cleaning more efficient. This concept was tested in co-operation with the high-pressure cleaning agent producer Kadant Nordic AB.

The Paper Industry is experiencing radical change: continuing and increasing digitalisation means that demand for graphic paper is decreasing; at the same time strong growth in the online mail order business is one of the driving factors in the growing demand for board and packaging paper. As a result, the share of packaging papers in total worldwide paper and board production is on the increase. A negative consequence of this can be seen in the composition of waste paper: The amount of graphic paper with relatively fresh fibre content in recycling is decreasing. The result is a growing proportion of adhesive impurities and shorter fibres in waste paper. The quality of waste paper used in paper production and thus also the production process itself suffer, as fewer and fewer high-quality fibres are available for use in the manufacturing process.

Contamination as a consequence of lower waste paper quality

In the paper making process foreign substances and adhesive impurities contained in waste paper result in contamination of both paper machine and clothing. In the dryer section, in particular, this leads to sticky deposits on fabrics and rolls. Due to higher sheet moisture in the early positions of the dryer section and lower sheet strength related to this, dirt particles are "plucked" from the paper surface and are increasingly deposited on the dryer fabric.

Consequences for paper production

Dirt deposits on dryer fabrics, cylinders, and rolls have negative consequences for paper production: Dirty rolls lead to increased wear of the dryer fabric and thus reduce its life time. In addition to this deposits on drying cylinders impair the heat transfer to the sheet. As a result steam consumption in the dryer section increases: Machine speed has to be reduced in order to guarantee an optimum dry content of the paper.

Peaks in the moisture profile of the sheet caused by fabrics suffering from uneven contamination pose a further problem. In order to balance these out the drying process needs to be intensified. This frequently leads to partial over-drying. Outside the moisture peaks the moisture content falls below the optimum. Further typical symptoms of contamination are sheet fluttering and creasing: These cause sheet breaks which lead to lengthy machine shutdowns. Inferior paper quality is another problem that should not be ignored: e.g. through cockling, an impaired topography, or flatness of the paper, which impacts negatively on the future print image (see Fig. 1).

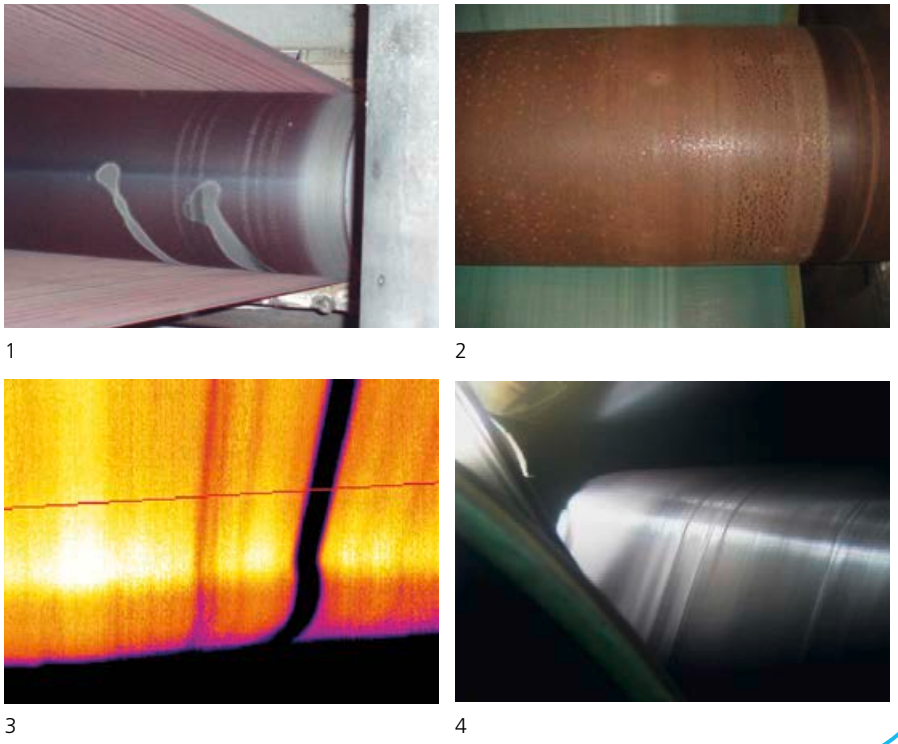

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Fig. 1 Problems due to contamination of dryer fabrics – deposits and corrosion on the roll (1 and 2), uneven moisture profiles (3), creases in the sheet (4).

The solution: a "contamination resistant" dryer fabric

In order to minimise the consequences of contamination deposits in the dryer section we would need a dryer fabric that effectively prevents the adhesion of dirt particles and that makes cleaning of the fabric even more efficient. It was this notion of an "ideal dryer fabric" that propelled Heimbach to focus on the development of a new design. The aim of the felt manufacturer was to combine high contamination resistance and improved cleanability of the dryer fabric in one single solution. In this context Heimbach focused on factors that impact on the degree of fabric contamination as well as the cleaning effect.

Factors impacting on the degree of contamination of the dryer fabric:

- Type of fabric (spiral or woven)
- Weave design
- Yarn material and structure
- Type of coating

Factors impacting on the cleaning effect:

- Weave design and type of fabric
- Type of cleaning process (e.g. high-pressure cleaning, passivation by chemical substances (silicon oils) on fabric or cylinder, use of dry ice, pressurised air)
- Configuration of the cleaning agent and its position (on or after the roll).

Contamination behaviour and paper contact area

In order to find out precisely how the above-mentioned factors impact on the contamination of a dryer fabric Heimbach initially analysed samples of used contaminated dryer fabrics. While checking the condition of seams and woven fabrics it was noticed that, particularly in the early positions of the dryer section, dirt particles are deposited on the MD yarns of the paper side. In the later positions, on the other hand, it is predominantly the woven fabric between the MD yarns that is contaminated by "stickies" (see Fig. 2).

Comparison of cleaning effects

On the basis of these findings Heimbach developed a dryer fabric prototype and tested the cleaning effect on this and various alternative weave designs: For this purpose contaminated fabric samples of various designs were assembled into a single dryer fabric and cleaned with a high-pressure water spray (see also Fig. 3 and Tab. 1). All the fabrics used in this case were previously employed in comparable dryer positions and displayed a practically identical degree of contamination at the beginning of the trial. In co-operation with the manufacturer of high-pressure cleaners, Kadant

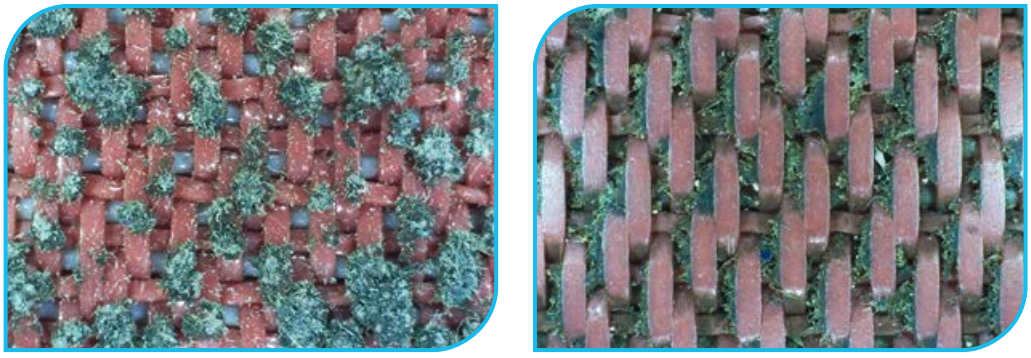

Fig. 2 Depending on the point of application dirt particles can be deposited either along the MD yarns or in between.

The degree of contamination of the dryer fabrics is most pronounced in the early positions of the dryer section. The cause of this is the large contact area between dryer fabric and sheet, generated by the MD yarns, as this, in turn, means more dirt deposits. Thus the analysis provided an initial approach: In order to optimise the fabric design the area of attack, i.e. the contact area, needs to be reduced on the paper side.

Nordic AB, uniform testing conditions were created in order to carry out cleaning processes with different pressures (400-600 bar) and angles of impact of the water spray (oblique and vertical) as well as jet types in different intervals in each case. The air permeability of the fabric served as an indicator of the cleaning effect. In each case this was measured before and after cleaning. In addition the air permeability of the individual fabric in its original state was used as a reference point.

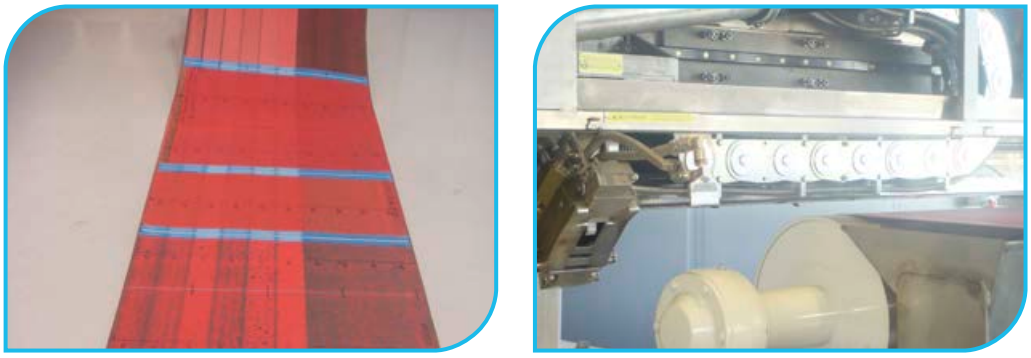

Fig. 3 The individual fabric samples were divided in MD direction into six sections (left). In each section the multi-jet high-pressure shower manufactured by Kadant traversed on the roll with different pressures, angles of impact, and numbers of traverses (right).

Sample Fabric	Weave Structure	Result
Fabric Design A	2-layer, woven dryer fabric in 2-warp system	• Poor cleaning effect between the yarns on the roll side • Dirt is pressed inside the fabric so that original air permeability cannot be achieved • Good cleaning of spaces between paper side yarns only possible with a steep angle of impact of the high pressure water jets
Fabric Design B	2-layer, woven dryer fabric; identical weave structure on both paper and roll side	• When oblique impact angle of the water jet is used it is difficult to reach between yarns on roll side • Higher pressure affects the cleaning effect • Original air permeability is restored with steep angle of incidence
Fabric Design C	2-layer, woven dryer fabric with vertical funnel-shaped design	• Very good cleaning result when using oblique or vertical impact angle of high-pressure water jet
Fabric Design D	1-layer, woven dryer fabric	• Good cleaning effect when using oblique or steep impact angle, due to lower internal void volume • Original air permeability not fully achieved because of dirtier roll side • Pressure of high-pressure water jet not decisive

Tab. 1 Test arrangement with four different weave structures.

A clean fabric design

The cleaning effect is heavily dependent on the set parameters of the high-pressure shower and on the weave design (see also Tab. 1 and Fig. 4).

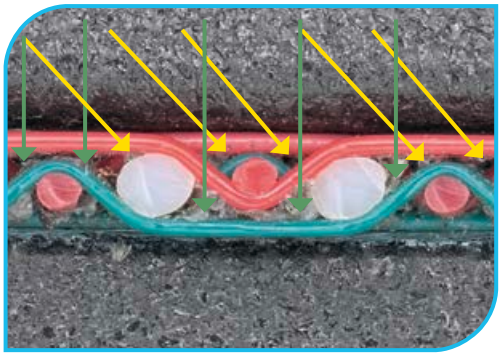

Fig. 4 The weave structure of design A prevents the water jet from penetrating in between the yarns even with an oblique impact angle.

Fabric design C corresponds most closely to the ideal dryer fabric: A good cleaning effect and a return to original air permeability was achieved independent of the angle of impact of the water jet (Fig. 5). The vertical funnel structure makes it possible to hose down and suck out dirt particles more effectively.

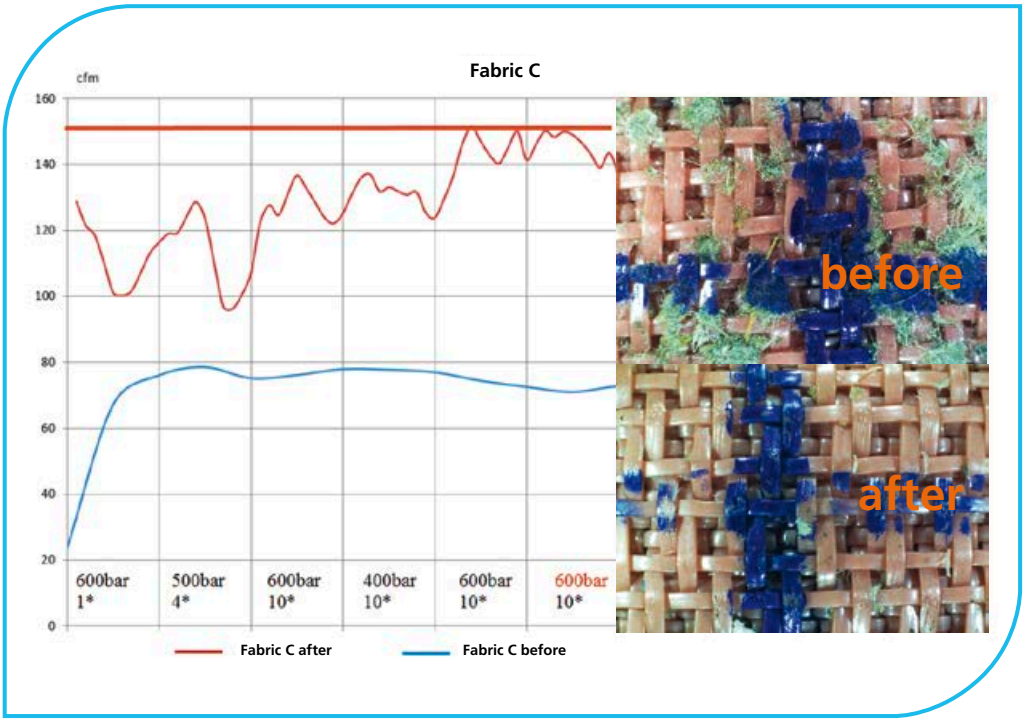

Fig. 5 With the newly developed dryer fabric Secoplan V it became possible to restore the original air permeability of the dryer fabric, independent of the impact angle of the water jet.

Furthermore the structure of the paper side, with a reduced contact area and smaller number of contact points, reduces the potential for deposits of contaminated material. (Fig. 6).

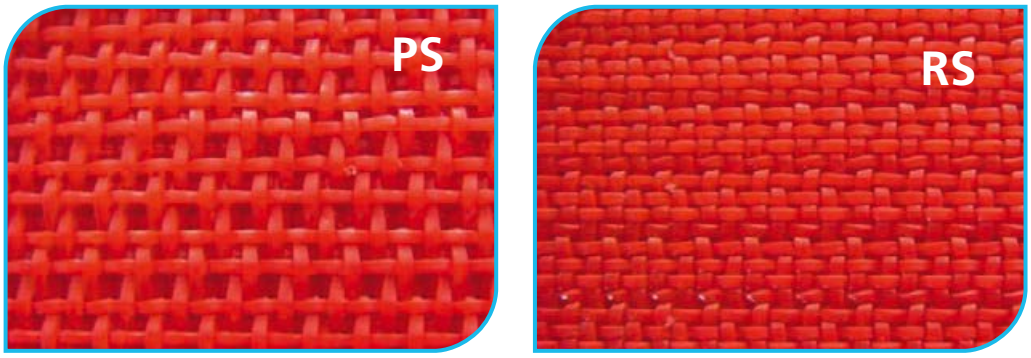

Fig. 6 A smaller number of contact points as well as a reduced contact area on the paper side prevent adhesion of dirt and make cleaning more efficient. Conversely, the density of yarns on the roll side increases wear resistance.

If, as was the case during the test run, cleaning is done on the roll, dirt is often pressed through the fabric onto the roll and is deposited there: This leads to increased wear or in renewed contamination of the dryer fabric on the roll side (re-contamination). In order to prevent this the fabric manufacturer has created a particularly dense structure on the roll side in the newly developed dryer fabric type Secoplan V: It increases the contact area and makes the fabric less permeable for impurities (Fig. 7).

Fig. 7 The vertical funnel structure makes easy cleaning deep into the fabric possible and its small channels prevent dirt being pressed through the fabric onto the roll.

Conclusion

The newly developed dryer fabric design is less susceptible to dirt deposits and makes cleaning with a high-pressure water spray on the roll position more efficient. A note of caution: Such a fabric design is not a "panacea" for all contamination in the dryer section. The choice of the right kind of fabric design clearly depends on paper grade and the resulting intensity of contamination, on sensitivity to marking, as well as on conditions within the machine. With waste paper quality continuing to deteriorate the risk of dirt deposits in the dryer section will certainly increase. For this reason the newly developed Secoplan.V dryer fabric is tailor-made for positions that are prone to heavy contamination – in particular in the production of board and packaging papers.